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Research Article

# A Review on Childhood Obesity

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**Abstract:**

Obesity is a condition characterised by excess accumulation of fat in the body. Childhood obesity is a state in which a child is remarkably overweight for his or her age and height. Childhood obesity is defined as a BMI greater than or equal to 95$^{th}$ percentile for children and teens of same age and sex. Childhood obesity is caused due to a complex interaction between number of factors including genetic, environmental, ecological, socio-cultural, and psychological factors. Clinical evaluation is done to identify the cause of obesity and obesity-related comorbidities. The evaluation consists of physical examination and complete history examination. Childhood obesity is associated with a number of consequences including immediate health issues and future risks. A staged approach is recommended in the treatment of obesity. initial management is carried out in primary care with focus on healthy dietary habits and increase physical activity. Those not showing response to primary care interventions or having significant health risks should be managed by a multidisciplinary team with expertise in childhood obesity. Pharmacotherapy or bariatric surgery is considered if there is no response to weight management.

**KEYWORDS**: Childhood obesity, pediatric obesity, causes, consequences, treatment

## Introduction:

Obesity is a condition characterised by excess accumulation of fat in the body. [1]Obesity is determined using various methods including body mass index, waist circumference, waist- to-hip ratio, skinfold thickness and bioelectrical impedance. Body mass index (BMI) is the most commonly used method to measure obesity.[2] Obesity in childhood known as paediatric obesity has become an important health issue worldwide. Childhood obesity in most cases lead to adult obesity especially in those having severe obesity or a family history of obesity.[3]

## Childhood Obesity

### Definition

Childhood obesity is a state in which a child is remarkably overweight for his or her age and height. Childhood obesity is mainly measured based on body mass index. [4] Childhood obesity is defined as a BMI greater than or equal to 95$^{th}$ percentile for children and teens of same age and sex.[5]

According to WHO, for children below five years weight-for-height ratio above two standard deviations from WHO Child Growth Standard is considered overweight and above three standard deviation is considered obese.[6]

### Etiology

Childhood obesity is caused due to a number of complex factors including genetic, environmental, ecological, socio-cultural, and psychological factors.

### Genetic factors

- Genetic factors are linked to variation in body weight.

- Some studies have concluded that body mass index is 25-40 percent hereditary.[7]
- Genetic factor is usually combined with environmental and other factors contributing to obesity.
- Less than 5 percent cases are directly linked to genetic cause.[7]
- Thus, genetic susceptibility has a role in development of obesity but it is not the reason for the rapid rise in childhood obesity worldwide.
- Gene defects are also associated with childhood obesity. Both polygenetic and monogenetic defects are linked to the disease.
- In children with obesity, single gene defects due to mutation in melanocortin 4 receptor is identified. Other gene defects in leptin receptors, proopiomelanocortin and proprotein convertase are also reported.[8]
- Increasing evidence suggest that epigenetic factors play an important role in the development of the disease. These factors alter the interaction between environment, nutrition and microbiome leading to obesity[9].

**Environmental factors**

- Modern life style changes including increased consumption high calorie diet and sedentary life style have significantly contributed to the rise in paediatric obesity.
- Dietary habits including increased use of sweetened beverages, snacks, fast food and high portion size also important contributors of obesity.[7]
- The unhealthy eating habits are coupled with low physical activity to worsen the condition.
- Increased time spent in front of television, mobile phones, computers and tablets are directly linked to the prevalence of obesity in children.[10]
- Increased dependence of children on electronic games and decreased participation in outdoor games is also a cause of paediatric obesity [11].
- Some studies have also associated of child obesity of parental feeding styles [12], perinatal factors [13,14], birth size [15], breast feeding status [16], environmental chemicals [17] and adverse life experiences [18].

**Ecological factors**

- Ecological factors related to obesity include family related factors, community and school environment
- Family factors including types of food consumed in the family and food preferences of family members have an impact on the child's dietary pattern. Family mealtimes can also influence the child's eating behaviour. Family lifestyle pattern, whether it is active or sedentary also influence the child.[19]
- School environment also play a vital role in the development of obesity[7]

**Socio-cultural factors**

- Socio-cultural factors also lead to obesity.
- Our society use food as a reward and as a way of socializing.
- This use of food can lead to of unhealthy eating habits, hence increasing the chance of developing obesity.[19]

**Psychological factors**

- Various psychological factors such as depression and anxiety,[20] self-esteem [21], eating disorder symptoms [22], emotional problems [23] and body dissatisfaction [24] have also found to cause childhood obesity.

**Clinical Evaluation of Childhood Obesity**

- Clinical evaluation is done to identify the cause of obesity and obesity-related comorbidities. The evaluation consists of physical examination and complete history examination.[25]

- A **complete history** examination includes:

a) **Dietary history**- It consist of details like dietary habits including frequency of food consumption, types and content of food consumed, intake of calorie-dense foods such as fruit juice, fried foods, soda etc.

b) **Physical activity assessment**-It consist of details like time spent in unstructured play, sports activities, physical education and screen time (mobile phones, television, tablets and video games).

c) **Medical history**– It consist of details like history of use of medications causing weight gain such as

glucocorticoids, antiepileptic drugs and antipsychotic drugs.

d) **Developmental history**-It helps to determine any developmental delay that may point towards a chromosomal or genetic cause for obesity.

e) **Complete examination of symptoms-** It helps to determine under-lying cause for the weight gain, such as Cushing syndrome or hypothalamic tumor. The review of symptoms is also helps in screening for obesity-related comorbidities such as OSA.

f) **Family history**- Examination of family history of obesity and related co-morbidities act as predictor of persistence of obesity into adulthood.

g) **Psychosocial screening**-It consist of details related to depression, peer relationships, and disordered eating habits etc.

- **Physical examination** should include:

**a) Height measurement**

b) **Assessment for dysmorphic features** linked to chromosomal or monogenic cause and for Cushingoid features.

c) **Blood pressure measurement** with an appropriately sized cuff. [25,26,27,28]

- Various **laboratory investigation** to determine childhood obesity include:

a) **Fasting lipid profile**-. Experts recommend measurement of fasting lipid profile in obese children (BMI between the 85th and 95th percentiles) free from risk factors.[26]

b) **Fasting blood glucose or hemoglobin** [26]

c) **$A1_c$andaspartateaminotransferaseandalanine aminotransferase levels** if they are 10years and above and prone to risk factors like elevated blood pressure,elevated lipid levels, family history of obesity etc. [26]

## Consequences of Childhood Obesity

Childhood obesity can lead to a number of consequences which may be immediate health issues or health risks in future.

Immediate health issues may include:

- Increased blood pressure and increased cholesterol levels, which are risk factors for cardiovascular disorders.
- Greater risk of impaired glucose tolerance, insulin resistance, and type 2 diabetes mellitus
- Pulmonary disorders such as asthma and sleep apnea.
- Joint problems and musculoskeletal discomfort.
- Fatty liver, gallstones, and gastro-esophageal reflux disease

Childhood obesity is also related to

- Psychological disorders such as anxiety and depression.
- It may also lead to low self-esteem and thus lower health related quality of life.
- Social problems like bullying, discrimination and stigma.

Future Health Risks of paediatric obesity include:

- Obese children are more likely to become obese adults.
- Adult obesity is associated with increased risk of severe diseases including cardiovascular disease, type 2 diabetes, cancer and even COVID-19
- Similarly, disease severity and associated complications of obesity in adulthood are more likely to be higher in obese children.[29]

## Treatment of Childhood Obesity

- A stage approach is recommended by The Expert Committee on the Assessment,

Prevention, and Treatment of Child and Adolescent Overweight and Obesity. This includes:

- **Stage1**(Prevention Plus) can be carried out in a primary care office setting, five or more servings of fruits and vegetables per day, avoid intake of sugar-containing beverages, reduce screen time to less than two hours and perform physical activity for at least two hours per day. If no improvement is seen in BMI for about 3-6 months, then stage 2 is considered.
- **Stage2**(Structured Weight Management) can be implemented in a primary care setting with a dietitian, it includes stage1 guidelines with increased emphasis on

structure of meals and snacks paying special attention to energy density of food.

- **Stage3**(Comprehensive Multidisciplinary Intervention) can be implemented with the help of a multidisciplinary team. This stage includes stage2 guidelines along with increased physical activity and dietary program.
- **Stage 4** (Tertiary Care Intervention) can be implemented in a paediatric weight management centre with a multidisciplinary team consisting of experts in paediatric obesity. In addition to stage 3 recommendations, medications, highly structured dietary regimens, or bariatric surgery are included in stage 4[30]

- The weight loss goals are determined depending on the age of the child and severity of disease and co-morbidities associated with it. [30]

## Pharmacological Therapy

### I. Medications

- The role of pharmacological therapy in the treatment of pediatric obesity is limited.[31]
- Orlistat is the only medication approved by the Food and Drug Administration for the treatment of obesity in adolescents (12 years old)[32,33]
- It is a a lipase inhibitor that blocks absorption of about one-third of the fat ingested in a meal.
- Adverse effects of orlistat include diarrhea, abdominal pain, flatulence, and greasy stools. Orlistat also inhibits absorption of fat-soluble vitamins hence administration of multivitamin is recommended.
- However, the use of use of orlistat was banned in India in 2010 due to its health damaging side effects. Use of the medicine was found to cause high blood pressure and heart problems.
- Metformin, a drug approved for the treatment of type 2 diabetes mellitus in children above 10 years of age has been used off-label for weight loss in several trials but results only in modest reductions in BMI.[34]
- Other medications that have been used off-label for the treatment of obesity in children include topiramate [35] and glucagon-like peptide-1 analogs such as exenatide[36]

### II. BARIATRIC SURGERY

- Bariatric surgery in adults has shown to decrease obesity and obesity-related co-morbidities as well as reduce mortality. As a result, bariatric surgery has been performed in adolescents with severe obesity. There has been an increase in the number of bariatric surgery procedures in adolescents [37]
- The most common operations performed in children with severe obesity include:
  - **Roux-en-Y gastric bypass (RYGB)**,
  - Laparoscopic Adjustable Gastric Banding (LAGB)
  - Vertical Sleeve Gastrectomy.
- The goal of bariatric surgery is to provide the maximum possible benefit with the lowest risk.
- It is advised to perform the surgery only when the child is at least 13 years in case of girls and 15 years for boys.[37]

## Conclusion

- Pediatric obesity has become one of the most serious medical and public health issues nowadays.
- The disease prevalence is awfully high, and the rate continues to increase.
- The etiology of the disease is complex, resulting from an interaction between genetic, environmental, ecological, social and psychological factors.
- Childhood obesity is associated with several comorbidities that affect physical and mental health.
- The clinical evaluation is usually done through physical and complete history examination.
- Childhood obesity is associated with a number of consequences including immediate health issues and future risks.
- A staged approach is recommended in the treatment of obesity, initial management is carried out in primary care with focus on healthy dietary habits and increase physical activity. Those not showing response to primary care interventions or having significant health risks should be managed by a

multidisciplinary team with expertise in childhood obesity.

- Pharmacotherapy and/or bariatric surgery should be considered if there has been no response to structured weight management with a multidisciplinary team.
- Additional research is required to determine the efficacy and safety of these modalities.

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